IMPORTANCE OF MEDICINAL AND AROMATIC PLANTS AS A MAJOR SOURCE OF RISK REDUCED PESTICIDES

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Abstract: Pesticides are the only toxic substances released intentionally into our environment to kill living things. The use of toxic pesticides to manage pest problems has become a common practice around the world. In the developing countries nearly 80% of the people, directly or indirectly engaged in the agriculture sector and using chemical pesticides as a major source to control pest in cropping field. It is estimated that nearly 3 million farm workers experience severe pesticides poisoning, resulting to about 18,000 deaths; while about 25 million workers suffer from mild pesticide poisoning each year. Over, 98% of sprayed insecticides and 95% herbicides reach a destination other than their target species, present in air, water, and soil. Hence it also causes environmental pollution. Considering the harm that chemical pesticides may pose, using natural pesticides to control pests is an advantageous solution. Natural pesticides or green pesticides are pesticides derived from the organic sources which are considered environment friendly and it has broad spectrum in pest control, safe to apply, unique in action and can be easily processed and applied. Over the past 50 years, more than 2000 plant species belong to different families and genera have been reported to contain potential toxic principles. Plants contains large number of secondary metabolites and those categorized under terpenoids, alkaloids, glycosides, phenols, tannins etc. plays a major role in plant defence and cause behavioural and physiological effects on pests. Many plant essential oil show a broad spectrum of activity against pest insects and plant pathogenic fungi ranging from insecticidal, antifeedant, repellent, oviposition deterrant, growth regulatory and anti vector activities. Neem, phyrethrum, basil, kalmegh, eucalyptus, garlic, lemon grass, mint etc. are some of the examples of medicinal and aromatic plants with potential pesticidal properties. By proper utilization of these plants as biopesticides in agriculture, possible to get higher yield, minimizes the conventional pesticide usage, avoids the accumulation of pesticide residues, increases farmer income and enhances environmental health.

Keywords: Pesticide, Pollution, Antifeedant, Repellent, Oviposition, Biopesticide.

Introduction: Pesticides are substances meant for attracting, seducing, and then destroying, or mitigating any pest. They are a class of biocide. The most common use of pesticides is as plant protection products (also known as crop protection products), which in general protect plants from damaging influences such as weeds, plant diseases or insects. This use of pesticides is so common that the term pesticide is often treated as synonymous with plant protection product [1].Although pesticides have benefits, some also have drawbacks, such as potential toxicity to humans and other species.Pesticides may cause acute and delayed health effects in people who are exposed. Pesticide exposure can cause a variety of adverse health effects, ranging from simple irritation of the skin and eyes to more severe effects such as affecting the nervous system, mimicking hormones causing reproductive problems, and also causing cancer. A 2007 systematic review found that "most studies on non-Hodgkin lymphoma and leukemia showed positive associations with pesticide exposure" and thus concluded that cosmetic use of pesticides should be decreased[2].Limited evidence also exists for other negative outcomes from pesticide exposure including neurological, birthdefects, fetal death and neurodevelopmental disorder[3].

The World Health Organization and the UN Environment Programme estimate that each year, 3 million workers in agriculture in the developing world experience severepoisoning from pesticides, about 18,000 of whom die. According to one study, as many as 25 million workers in developing countries may suffer mild pesticide poisoning yearly [4].

Pesticide use raises a number of environmental concerns. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, including non-target species, air, water and soil. Pesticide drift occurs when pesticides suspended in the air as particles are carried by wind to other areas, potentially contaminating them. Pesticides are one of the causes of water pollution and some pesticides are persistent organic pollutants and contribute to soil contamination.In addition, pesticide use reduces biodiversity, contributes to pollinator decline, destroys habitat (especially for birds)[5].

To overcome the problems of synthetic chemical hazards, one of the best control measures is the use of plant origin products/ botanicals.

Botanicals are materials or products of plants origin valued for their pesticidal, medicinal or therapeutic properties. Phytopesticide materials range from whole fresh plants to purely isolate

bioactive phytochemicals or their formulations which are effective against pests and pathogens. These natural pesticides are renewable and could be prepared as fresh dried products, liquid extracts, powders, cakes or in miniporous bags[6].

The popularity of the plant products increasing day by day because of their biodegradability, least persistence and least toxic to non-target organisms, economic and easy availability.Today about 200 plants with insecticidal activities are known. Among those plants, most promising are Neem, Pyrethurm, Basil, Kalmegh, Eucalyptus, Garlic and Lemon grass.In this regard, present review, attempt is tostrengthen the data regarding active potent compounds present in these crops and its effects on agricultural pests.

Neem: Neem (*Azadirachta indica* A. Juss Fam. Meliaceae) has a wide range of uses in the control of crop and household pests, for medicinal purposes and as shade trees.All parts of the *A. indica* tree possess insecticidal activity but seed karnel is the most effective. It has a multitude of pesticidal active ingredients which are together called "triterpene" more specifically "limnoids". The four best limnoids compounds are: Azadirachtin, Salannin, Meliantriol, and Nimbin.Azadirachtin is active in nearly 550 insect species, mostly in orders Coleoptera (beetles and weevils); Dictyoptera (cockroaches and mantids); Diptera (flies); Heteroptera (true bugs); Homoptera (aphids, leaf hoppers, wasps, and ants); Isoptera (termites); Lepidoptera (moths and butterflies); Orthoptera (grasshoppers, katydids), Siphonaptera (fleas); and Thysanoptera (thrips). It effects on insect reproduction, direct and "secondary" antifeedancy, and the physiological effects measured as growth reduction, increased mortality and abnormal and delayed moults.Its antiviral, antifungal, antibacterial and insecticidal properties have been known for several years [7].

Phyrethrum: Pyrethrum is a natural insecticide made from the flowers of certain species of chrysanthemum. Pyrethrins are naturally released from *Chrysanthemum* flowers. The flowers contain about 1-2% pyrethrins, relative to its dry weight, but approximately 94% of the total yield is concentrated in the seeds of the flower. There are six biologically active chemicals in pyrethrins that are responsible for the knockdown properties of the insecticide. They are divided into two groups: pyrethrins I and pyrethrins II. Pyrethrin I, cinerin I, and jasmolin I are esters of chrysanthemic acid whereas pyrethrin II, cinerin II, and jasmolin II are esters of pyrethric acid. Pyrethrins affect the nervous system of insects, causing paralysis and a "knockdown" effect. They bind to sodium channels of nerve cells, prolonging their opening, and thereby causing possible death. Aphids, armyworm, cucumber beetle, cut worms, white flies, leafhoppers, thrips, beetles are often brought under control with pyrethrum [8].

Basil: Basil belongs to the genus Ocimum and is a member of the mint family (Lamiaceae). The genus includes over sixty species of annuals, non-woody perennials and shrubs native to Africa and other tropical and subtropical regions of the Old and New World. Although several basil species are found in many regions, the species *O. basilicum* is the most cultivated variety in the world. The extracts of basil obtained by different methods are considered to be antimicrobial, insecticidal and useful in a number of medical treatments. *O. basilicum* leaf oil yielded 80 identified constituents representing 91.11 % with dominant components consisting of linalool (43.78 %) followed by eugenol (13.66 %), 1,8-cineole (10.18 %), α-epi-cadinol (5.76 %), γ-cadinene (1.99 %), γ-terpineol (1.75 %) and γ-muurolene (1.35 %), respectively. Essential oils act as a insect repellent like mosquito, bugs etc. and it is recorded antimicrobial activity also. Some study noticed that basil oils are very good in controlling diamondback moth, beet armyworm, common cutworm, cabbage looper, cabbage webworm, leaf eating beetle etc.[9].

Kalmegh: *Andrographis paniculata* is a herb endogenous in southeast Asia, China and India. It is commonly known as king of bitters. It is a small annual herb, has a similar strong bitter taste as that of the large Neem tree (*Azadirachta indica*). *Andrographis paniculata* grows erect to a height of 30–110 cm in moist, shady places. The slender stem is dark green, squared in cross-section with longitudinal furrows and wings along the angles. The lance-shaped leaves have hairless blades. The small flowers are borne in spreading racemes. The fruit is a capsule and it contains many yellow-brown seeds. Its major chemical constituents are diterpenoids, flavonoids and polyphenols. Among the single compounds extracted from *A. paniculata*, andrographolide is the major one in terms of bioactive properties and abundance. It act as a antifeedent and affect the oviposition. Kalmegh leaf extract can be effectively used to control *Helicoverpa armigera*, aphids, thrips, leaf defoliators, dimond back moth etc in different agricultural crops [10].

Eucalyptus: Eucalyptus (family Myrtaceae), an Australian native, represented by around 700 species is a genus of tall, evergreen and magnificent trees cultivated world over for its oil, gum, pulp, timber, medicine and aesthetic value. Among the various wood and non-wood products, essential oil found in its foliage is the most important one and finds extensive use in food, perfumery and pharmaceutical industry. In addition,the oil possesses a wide spectrum of biological activity including anti-microbial, fungicidal, insecticidal/ insect repellent, herbicidal, acaricidal and nematicidal. Theyare

complex mixture of mainly terpenoids, particularly monoterpenes and sesquiterpenes and a variety of aromatic phenols, oxides, ethers, alcohols, esters, aldehydes and ketones that determine the characteristic aroma and odour of the donor plant. Presence of volatile monoterpenes or essential oils in theplants provides an important defense strategy to the plants.eucalyptus essential oil can protectplants against rice weevils, pine processionary moths and mushroom flies. Eucalyptus essential oil could therefore have a role to play in the protection of cropsagainst mould, mildew and wood rot fungi. In addition, when applied in a vapour form, eucalyptus essential oil haspotential to manage weeds[11].

Garlic: Allium sativum, is a species in the onion genus, Allium.garlic is native toCentral Asia, and has long been a staple in the Mediterranean region, as well as a frequent seasoning in Asia, Africa, and Europe. It was known to Ancient Egyptians, and has been used for both culinary and medicinal purposes. Allium sativum is a bulbous plant. It grows up to 1.2 m (4 ft) in height.Fresh or crushed garlic yields the sulfur-containing compounds alliin, ajoene, diallyl polysulfides, vinyldithiins, S-allylcysteine, andenzymes, saponins, flavonoids. These components having antagonistic properties against pests of economic importance such as potato tuber moth, red cotton bug, red palm weevil, tea mosquitobug, black headed caterpillar, house flies and mosquitoes.Extracts of garlic have proved effective against *Alternaria spp*., powdery mildew, black spot, Phytopthera, *Fusarium spp*. and bacterial pathogens like Pseudomonas. Mode of action as well as the fungicidal and insecticidal properties of garlic, might be partly due to enzyme inhibition[12].

Lemon grass: *Cymbopogan citrates* (Poaceae) are native plants, abundant in Srilanka. Lemon grass is a tall, perennial sedge throwing up dense fasciclles of leaves from a short rhizome. It is a short day plant and produce profuse flowering in South India. The inflorescence is a long spike about one metre in length. Flowers borne on decompound spatheate ; panicles 30 to over 60 cm long. It contains 0.2-0.3% of essential oil in its leaves. This oil has an intense odour and taste. Citral a & b are the two main constituents present in the oil. It shows antibacterial property against *Staphylococcus aureus*, *Bacillus subtilis*, *Streptococcus faecalis*, *Mycobacterium avam*, antifungicidal activity against soil born fungi such as *pythium aphanidermatum*, *Pythium debrayanum* also act as a repellent to houseflies, flies etc.[13].

By proper utilization of these plants in the preparation of botanicals, it is possible to control pest incidence in agricultural fields and can produce food crops with higher yield, productivity with good quality and without effecting the environment.

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